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N4450

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Operating instructions Instrucciones de manejo Istruzioni per l'uso

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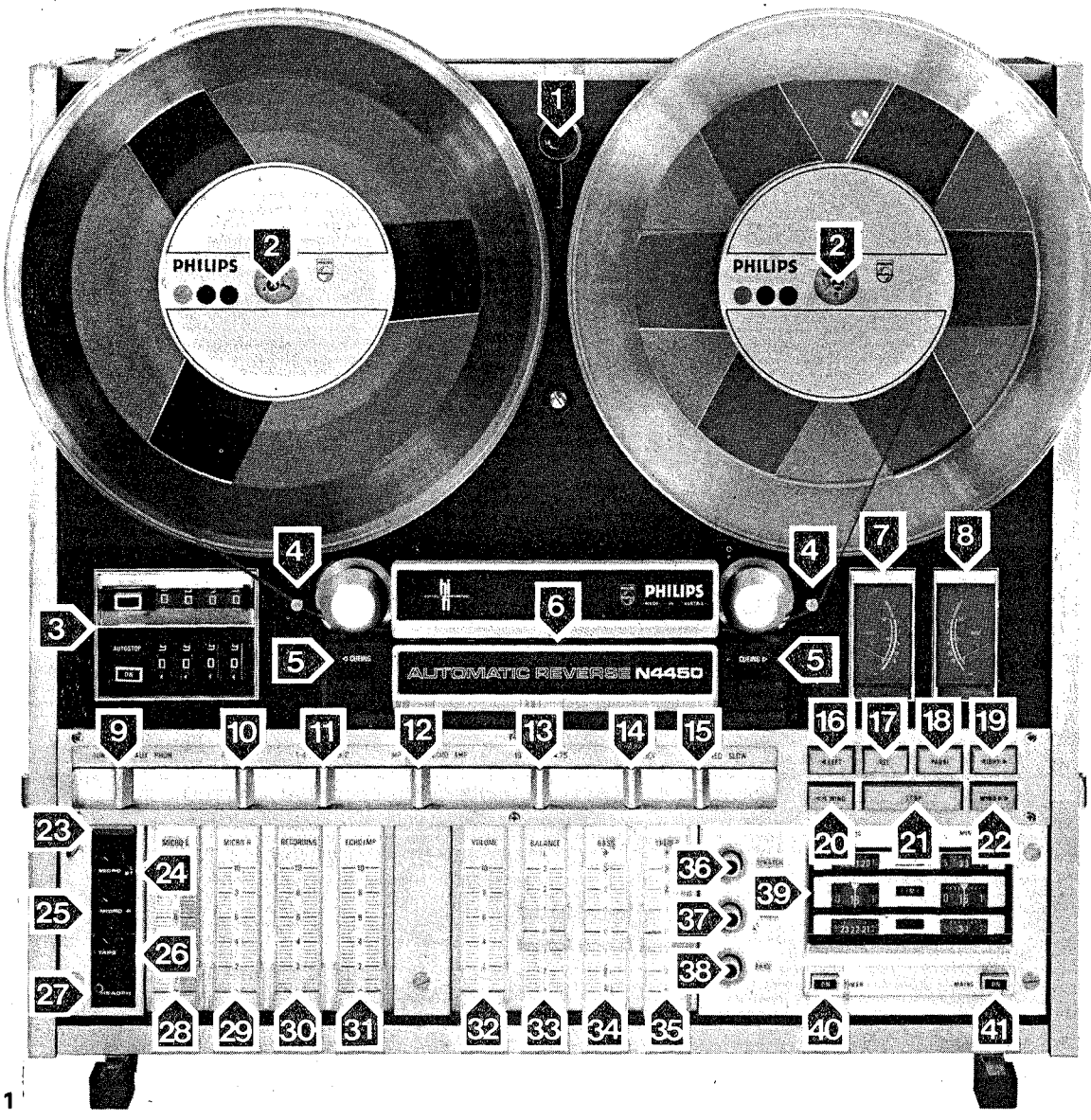
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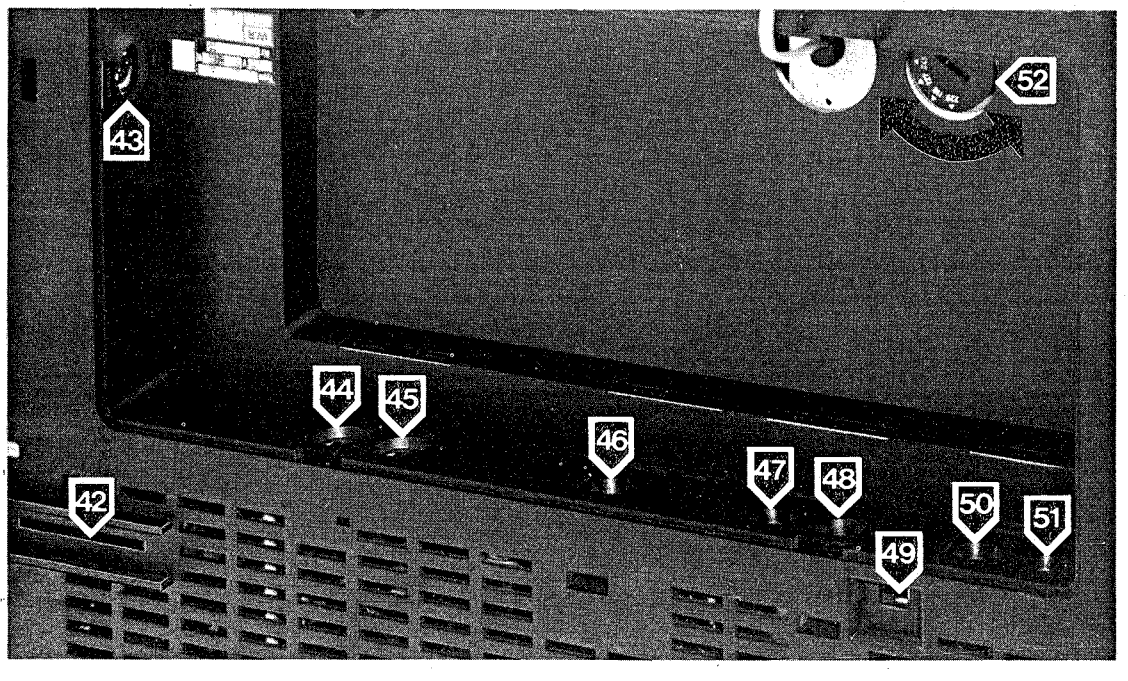
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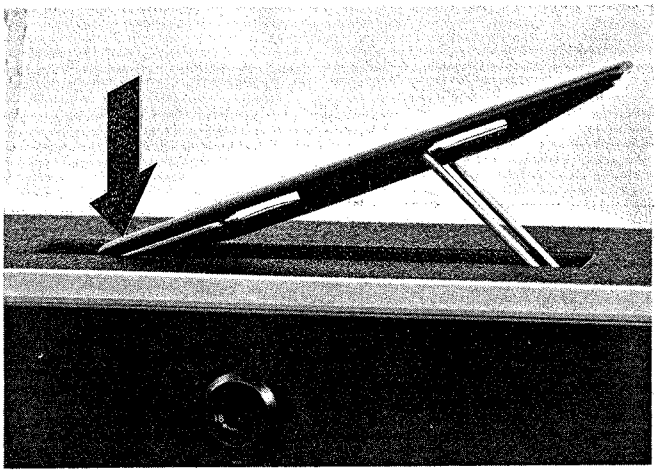

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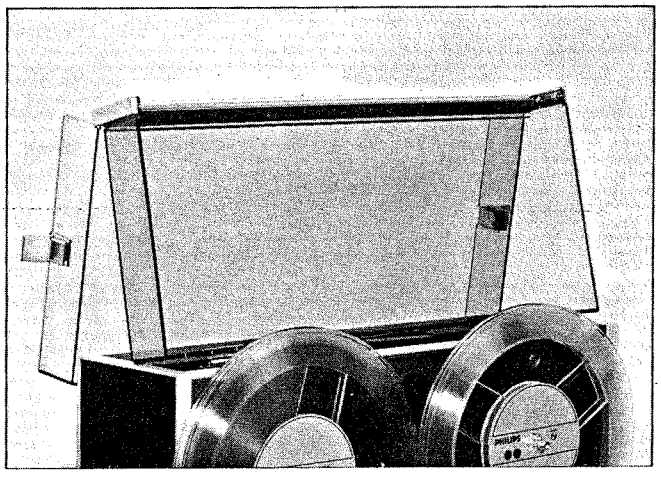

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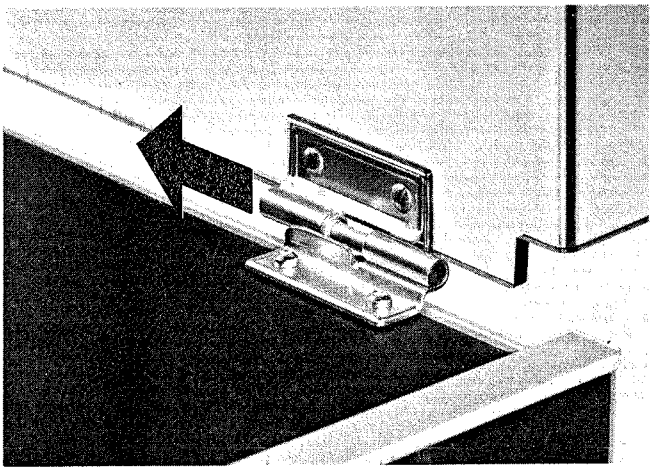

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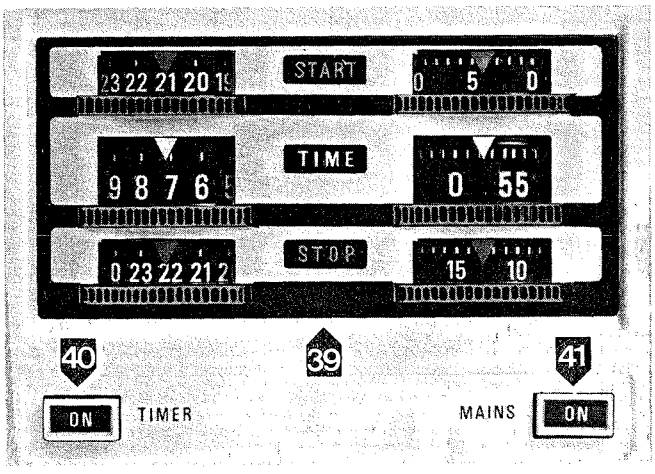
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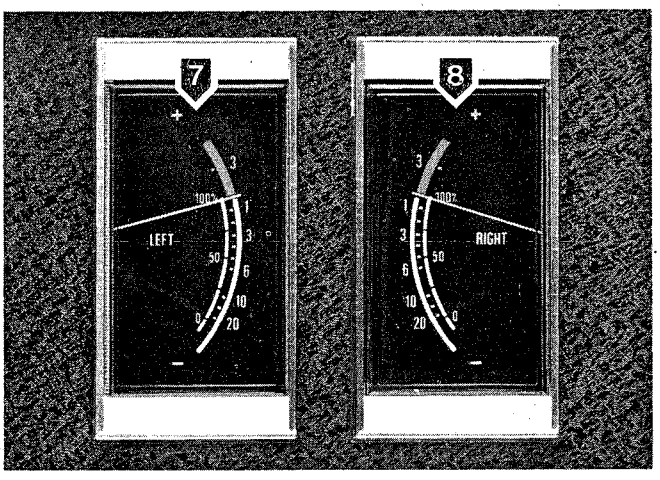
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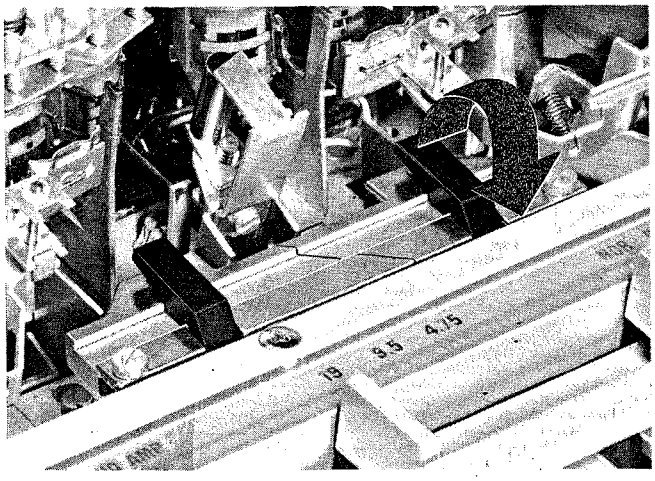

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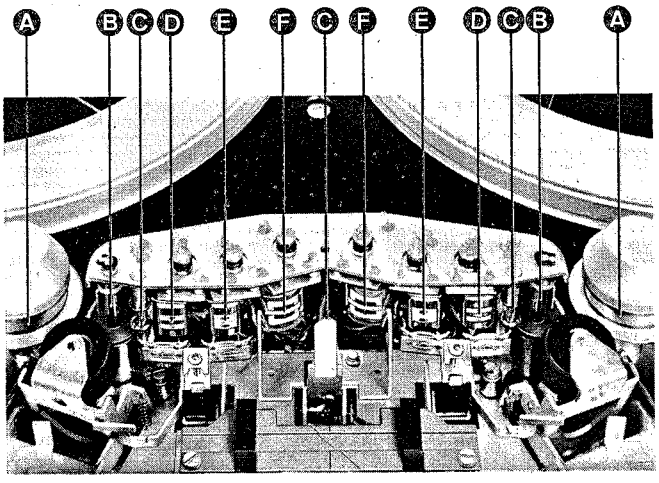
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INTRODUCTION

Your new Hi-Fi Stereo tape recorder/amplifier N 4450 has been designed with great care and precision to ensure that it meets the highest standards of quality and versatility.
This allows the recorder to be used for recording purposes where superior fidelity is required. The built-in powerful Hi-Fi stereo amplifier assures a perfect reproduction of these recordings and may also form the basis of a complete stereo system.
In addition to quality N 4450 also offers versatility: the reverse system (recording and playback in either direction) and several special effects such as multiplay, echo, reverberation and sound mixing. Moreover, the recorder incorporates an electric timer which permits the recorder to be started and stopped in the recording and the playback mode at preset times.
These and many other possibilities are described in these Operating Instructions, which we recommend you to read very attentively.

Part I of the Operating Instructions explains to the more interested reader how sound is recorded on magnetic tape: magnetic registration of sound. It provides a better insight into the operation of the recorder and it also contains interesting details which might open up new application possibilities.

Part II contains the actual Instructions for Use and describes the operating procedure. If you are anxious to try out your new recorder, it will suffice to read this part only.

We wish you many hours of listening pleasure with your new Hi-Fi Stereo tape recorder/amplifier N 4450.

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PART I "WHAT YOU SHOULD KNOW"

1. MAGNETIC SOUND RECORDING

A tape recorder serves to record sound on an audio tape and to reproduce the sound thus recorded in due time, preferably with the greatest possible fidelity.
However, before the sound can be recorded on the tape, it should be processed to suit this purpose.
The following Chapters describe in a concise but comprehensible manner the process of recording sound on magnetic tape. Each Chapter deals with part of this process, thus following the sound through the various steps, from the air vibrations which are recorded on the tape via the microphone and tape recorder, to reproduction via the loudspeaker.

1.1. FROM SOUND TO ELECTRICAL VIBRATIONS

Sounds that can be percepted by the ear are caused by alternations in air pressure; these are changes in air density which propagate in space as waves. A normal air flow at constant pressure (e.g. wind) is not yet perceived as sound.
The number of air-pressure vibrations per second determines the pitch of a tone. The higher the number of vibrations, the higher the pitch (frequency). The human ear can perceive approximately 20 to 16,000 vibrations per second. One vibration per second is called "Hertz" (after the well-known physicist), which is the unit of frequency.
The above-mentioned sound waves may be reflected, for instance by bare walls, or absorbed for example by curtains, and they can also cause an object to vibrate (e.g. the eardrum). The latter property is employed in a microphone.
A microphone is a device which converts sound into an electric current which can be further processed by the tape recorder. This principle is based on a physical law which, in simplified form, states: "Moving a magnet inside a coil (i.e. a change in magnetic field), causes a current in this coil." The intensity of the current changes with the movement of the magnet. It is evident that a similar effect is obtained when the coil is moved around the magnet. Modern microphones are usually based on this principle:
A coil is attached to a diaphragm. The sound causes the diaphragm to vibrate. As a result, the coil is moved in the magnetic field of a permanent magnet (the so-called electrodynamic microphone).
When the diaphragm and coil move in the rhythm of the alternations in air pressure, a current is induced in the coil whose intensity and frequency vary in accordance with the intensity and frequency of the sound vibrations.
This "alternating current" is a faithful representation of the sound and can now be applied to the tape recorder.

1.2. FROM ELECTRICAL VIBRATIONS TO MAGNETIC FIELD STRENGTH ALTERNATIONS

The alternating current produced by the microphone is amplified several times in the tape recorder. The degree of amplification can be adjusted with the recording level control and can be checked with the recording level indicator. This is necessary, since with a fixed amplification the loudest passages could be distorted and during the soft passages too much noise could be audible. During each recording the recording amplifier should be adjusted so that at the loudest passages the recording level indicator deflects to 100%; this is the limit at which just no audible distortion will occur.
When the recording level has thus been set, the soft passages will be reproduced clearly, doing full justice to the dynamic properties of both the recorder and the tape.
The alternating current thus amplified now reaches the recording head along which the magnetic audio tape is fed.
The actual recording process is, in fact, the reverse of what happens in the microphone: A current through a coil causes a magnetic field to develop in the core of that coil, which varies in accordance with the current intensity. So, if the current is an alternating current, the resultant magnetic field will be a so-called alternating field.
To boost the magnetic action of the recording head, the coil is wound round a ring-shaped iron core, which contains a microscopically small slit, the so-called air gap. Because the iron core presents only a very low resistance, the magnetic lines of force propagate in the core and close across the above-mentioned air gap, which they bridge in the form of an arc.
These lines of force which due to their alternating direction and strength are a faithful reproduction of the alternating current and thus of the sound to be recorded, are used to "write" the sound onto the tape.

1.3. MAGNETISING OF THE TAPE

Modern audio tape consists of a base of a synthetic material on which a highly uniform layer of iron oxide is coated. This coating consists of many microscopic particles of iron oxide which can be magnetised individually. When the tape passes the air gap of the recording head, the iron oxide particles located in front of the gap are magnetised by the instantaneous magnetic field strength.
When the whole tape has passed, it contains a pattern of adjacent iron-oxide particles that are differently magnetised and have the same or opposite polarity, depending on the strength and direction of the magnetic lines of force by which they have been magnetised when passing the recording head. Since the magnetic lines of force, in turn, were a faithful representation of the sound to be recorded, the magnetisation on the tape is also representative of this sound.
Audio tapes retain the information once recorded, even after numerous reproductions, unless they are exposed to another strong magnetic field (see "ERASING", I.2.1.).

1.4. FROM MAGNETIC RECORDING BACK TO ELECTRICAL VIBRATIONS

When playing back a magnetic recording on a tape, the tape is fed past the playback head and the process described in the previous Chapter is reversed.
When passing the air gap, the magnetised particles of different polarity and degree of magnetisation induce a magnetic field in the iron core of the head which results in an alternating current in the coil. This alternating current, which is still representative of the recorded sound, is amplified by the playback amplifier and is applied to the loudspeaker.

1.5. FROM ELECTRICAL VIBRATIONS BACK TO SOUND

The electrical alternations of the alternating current are converted into sound by the loudspeaker which is in fact the opposite of a microphone.
The alternating current from the playback amplifier is fed through a coil attached to a diaphragm, which is located in a strong and uniform magnetic field.
The alternating current in the core of the coil produces an alternating magnetic field.

The forces of this magnetic field now counteract the uniform force of the magnetic field of the loudspeaker magnet, so that the coil together with the diaphragm start moving in the rhythm of the alternating current. The diaphragm, in turn, causes the air to vibrate, thus producing the sound that was previously recorded via the microphone.
According to this method, sounds can be recorded on magnetic tape at any desired moment and reproduced unmodified at any moment afterwards.

2. SOME MORE TAPE RECORDING THEORY

2.1. ERASING

As already stated in Chapter 1.3, the tape retains the recorded information until it is exposed to another strong magnetic field.
This property is used in erasing. An existing recording is erased from the tape, when a new recording is made on the same part of the tape. This can be repeated indefinitely, without a deterioration in quality of the new recording. (However, erasing is also possible without making a new recording, by not applying a new signal to be recorded, Chapter II.3.6). For this purpose, the recorder is fitted with a so-called erase head, past which the tape is fed before it reaches the recording head. This erase head operates as follows:
Through a coil wound on a ring-shaped iron core, an alternating current is fed of a frequency far beyond the limit of audibility. The air gap in the iron core has been designed so that the magnetic field bridging the gap is dome-shaped.
When a magnetised particle of the tape passes the erase head, it is initially subject to increased magnetisation, after which the intensity subsequently decreases slowly to zero. (The increasing and decreasing magnetisation is the result of the shape of the magnetic field; the magnetisation is caused by the high frequency (RF) alternating current.)
The relevant particle is thus initially magnetised with increasing and then with decreasing strength and is magnetically neutral after passing the air gap. The recording is now "erased".

2.2. FOUR-TRACK SYSTEM

The four-track system indicates that four recordings can be made over the full width of the tape, so that four adjacent "tracks" of recordings are obtained on the tape. These can be four mono recordings or two stereo recordings, since in the case of stereo we have essentially two separate recordings. Because the recorder operates in accordance with the reverse principle, it incorporates two head systems each consisting of an erase head, recording head and playback head. One system is used when the tape runs to the left and the other when it runs to the right. Each system covers two tracks, which can be used separately (mono) or in combination (stereo) both for recording and playback. Depending on the position of the track selector you use track 1 and/or 3 when the tape runs to the right and track 2 and/or 4 when the tape runs to the left.
Recordings made on another four-track recorder can be played back on your recorder using the reverse system. The opposite is also possible.
Stereo recordings made on a twin-track recorder can be played back in one direction only and mono recordings in both directions.
Recordings made on your recorder can be played back on a twin-track recorder, if only tracks 1 and 3 are used and tracks 4 and 2 are empty or the other way round.

2.3. STEREO

When listening to, for example, an orchestra, your left ear perceives the sound coming from the left slightly sooner and louder than your right ear, and for sound coming from the right this is the other way round. The sounds from the middle are heard simultaneously and equally loud. This makes it possible for you even with your eyes closed, to determine the direction in which the various instruments lie: you can still "see" the orchestra in front of you!
When making a stereo recording of an orchestra, two microphones are used which pick up the sound in a similar way as your ears. The sound is then recorded on two separate tracks, one for the sound picked up by the left microphone (left channel) and one for the sound from the right microphone (right channel). When this stereo recording is played back stereophonically, these tracks are separately reproduced via two separate loudspeaker enclosures, one for the left channel and one for the right channel. Again, you can "see" the orchestra in front of you.
With your stereo tape recorder you can now make your own stereo recordings, for example of music, songs, speech, stereo broadcasts and stereo records, and reproduce these also in stereo. It is obvious, however, that you cannot make stereo recordings of e.g. a mono broadcast or mono record.

2.4. MULTIPLAY

This is the recording of a synchronised programme, consisting of several recordings on the same track, which renders it possible for instance to record a quartet which is rendered all by yourself.
While making e.g. the second recording, you can listen to the first recording via the headphones, the first recording being duplicated simultaneously and mixed with the second recording on the same track. By repeating this several times a combination of separate but synchronous recordings is obtained which are reproduced together.

2.5. ECHO AND REVERBERATION

When recording songs or music in e.g. a living room, reverberation can be added to the recording to create the impression that the recording was made in a large hall or church.
By the addition of echo, very special effects can be achieved. With your recorder echo and reverberation recordings can be made in a simple manner, as the recorder is equipped with separate, recording and playback heads which are mounted in line. The signal just recorded is then fed back from the playback head to the recording head and re-recorded together with the original signal. The effect is due to the distance between the two heads and depends on the tape speed; at the relatively low tape speeds of 4.75 and 9.5 cm/sec., echo effects are obtained and at the higher speed of 19 cm/sec. a reverberation effect.

3. TECHNICAL FEATURES

3.1. Hi-Fi QUALITY

The amplifier section of N 4450 as well as the recording section at the tape speeds 19 and 9.5 cm/sec. amply complies with the requirements of the Hi-Fi standard DIN 45 500. This DIN standard imposes very strict requirements as regards tape speed accuracy, frequency range, signal/noise ratio, distortion of the amplifier etc. The recorder has been designed for the use of Philips' high-output low-noise tapes which also come up to the above-mentioned DIN-standard. For best results it is therefore recommended to use only this tape on your N 4450 recorder.

3.2. AUTOMATIC REVERSE

The recorder features an "automatic reverse system". This means that, unlike most other tape recorders, the tape can run from left to right as well as from right to left. When the reverse system is operative, the tape after running from left to right, is automatically reversed by a strip of switching foil at the end. When the tape subsequently reaches the other end, the recorder is stopped.
Automatic reverse operation is possible during playback and recording. The direction can also be changed before the end of tape is reached by pressing one of the keys "◁ LEFT" (16) or "RIGHT ▷ " (19).

3.3. SIX HEADS

The recorder is provided with a total of 6 magnetic heads. For each tape transport direction a separate head system is provided, each comprising an erase head, a recording head and a playback head. Instead of the usual combined recording/playback head, this recorder has a separate head for recording and for playback. The main advantage of this is that the two heads can be specially designed for their specific function, giving optimum results both for recording and playback. Another advantage is that due to the separate recording and playback heads and preamplifiers echo and reverberation recordings can be made (see 2.5.) and so-called after-tape monitoring (see 3.4.) is possible.

3.4. BEFORE AND AFTER TAPE MONITORING

During recording, the signal can be monitored in two ways:
1. Before-tape monitoring. With switch (10) in position "B", the signal to be recorded is fed from the recording amplifiers to the recording-level indicators, to the sockets for connection of headphones and monitor amplifier and to the output amplifiers. This allows monitoring of the signal to be recorded **before** it is actually recorded on the tape.
2. After-tape monitoring. With switch (10) in position "A", the playback head scans the signal just recorded by the recording head and feeds it to the playback preamplifiers, the recording level indicators, the sockets for connection of headphones and monitor amplifier and finally to the output amplifiers. This permits you to check the result (the recording just made).

3.5. CUEING

To prevent unnecessary wear of the tape and the heads, the tape is lifted clear of the heads during fast winding, so that nothing is heard.
However, if during fast winding one of the cueing buttons (5) is depressed (which one depends on the direction of recording), the tape is applied to the heads and the recording becomes audible. Although the high winding speed and changed pitch make it sound very unusual, you will however be able to recognise characteristic parts of the recording after some practising. This makes it possible to stop the tape at these points. The possibility of varying the winding speed with the speed control (15) may also be convenient in rapidly locating a certain passage on the tape during cueing.

3.6. THREE MOTORS

The recorder is fitted with three motors. Two motors serve for driving the two reel discs and the third one, a special so-called "Hall"-motor, drives the two capstans and thus the tape during playback and recording on both directions. The use of one separate motor for the tape-transport functions during recording and playback ensures a high accuracy and reliability. The two motors for the reel discs ensure a high winding speed during fast winding.
In order to avoid a complex mechanical drive system, most of the functions are electro-magnetically controlled by means of relays.

3.7. 26.5-cm REELS

This recorder accepts reels with a diameter up to 26.5 cm. The use of plastic reels is preferred, as the recorder has been designed for this. Metal reels are heavier than plastic reels and may therefore cause problems when starting and stopping.
Due to the difference in tractive power required between large and small reels the recorder is provided with a reel selector switch.

3.8. TAPE TENSION COMPARATORS

To the left and right of the tape slot (6), two tape tension comparators (4) and two guide rollers are fitted. Through a special mechanism the tape tension comparators maintain a constant tape tension during playback, recording and fast winding. The rotating guide rollers ensure that the tape is precisely guided along its path.

3.9. PROGRAMME INDICATOR WITH PRE-SELECTOR

The programme indicator and the pre-selector (3) coupled to it facilitate the rapid location of a certain recording on the tape. When the programme indicator is set to "0000" at the beginning of the tape and the reading is taken at the beginning and end of a recording, this or another number can be set on the pre-selector. The tape is then automatically stopped when the programme indicator has reached the pre-selector setting.
This pre-selection facility is operative when the tape runs to the left and to the right and can be used during playback as well as fast winding. However, during recording the device is inoperative to prevent erroneous interruptions.

3.10. TIMER

The recorder incorporates a special timer (39), which allows recording or playback to be started or stopped automatically at a preset time. At the timer you can set the correct time and the desired starting and stopping time. When, for instance, for a recording one of the start keys, the record key and the pause key are pressed, recording is started and stopped at the preset times. This feature permits you to record for example a radio programme in your absence.

3.11. TIP-TOUCH KEYS

N 4450 is operated by relay-controlled electronic tip-touch keys instead of the conventional mechanically-operated push-buttons. These tip-touch keys respond to a very light touch, after which they are illuminated.
They also have a "memory", which means that e.g. when playback is interrupted for fast winding, the relevant start key remains illuminated, though less bright, to remind you of the direction of playback.
Another advantage of these keys is for example, during playback you may directly press the start key for the other direction or one of the fast-winding keys, without first pressing the stop key.
This feature also ensures that when different keys are pressed rapidly after each other the recorder and the tape cannot be damaged, as the last command is always carried out. In conjunction with the convenient slide potentiometers for recording level, volume, balance etc. these tip-touch keys provide for true ease and rapidity of operation.

3.12. Hi-Fi AMPLIFIER

The N 4450 is a combination of a Hi-Fi tape recorder and a Hi-Fi amplifier. In addition to reproduction of recordings made with the tape recorder, this stereo amplifier can also be used for amplifying signals from all other sound sources connected to it, such as microphone, record player, tuner etc., thus forming the centre of a complete Hi-Fi installation.
It features a "SCRATCH" (noise) and RUMBLE filter and also a physiology circuit ("PHYS") which boosts the low and high tones with respect to the mid range.
The controls for volume, balance, treble and bass are conveniently operated slide potentiometers. When you wish to use the amplifier section only and the recording section is not needed, you can render the tape transport inoperative (thus preventing unnecessary wear) by setting the function selector (12) to "AMP". The amplifier supplies 2 x 20 Watts continuous power (2 x 30 Watts music power) and is provided with connections for loudspeaker enclosures with an impedance between 4 and 8 ohms.

3.13. SPLICING JIG

Acces to the jig for editing and splicing the tape (Fig. 9) may be gained by removing the cover below the tape slot in a forward direction.
This built-in splicing jig consists of a guide slot for the tape, two tape clips and an oblique guide slot for the anti-magnetic tape cutter. It has the advantage that the tape can be edited with the reels normally placed on the turntables.
A very useful aid in tape-editing is the Philips' splicing kit SK 10 (optionally available).

3.14. REMOTE CONTROL

All tape transport functions plus the recording function can also be remote-controlled with remote control unit N 6719. This remote control unit is an optionally extra available and has a lead of approx. 7 m length. The tip-touch keys on the remote control unit correspond to the tip-touch keys on the recorder (keys 16 ... 22). The keys on the remote control unit are also of the tip-touch type, which illuminate when operated and have a "memory". When the remote control unit is connected, the remote-control keys and those on the recorder can be used side by side. The unit is supplied with a mounting bracket which enables the unit to be attached to a cabinet, an easy-chair or a wall.

3.15. CONTINUOUS TAPE REEL

The tape recorder can be used in conjunction with a continuous tape reel type EL 1907/52 (CE 10). A programme recorded on this continuous tape reel can be played back continuously as the endless tape repeats itself indefinitely. The continuous tape reel may be used, for instance, to repeat commercials in department stores and supermarkets.

3.16. SLIDE SYNCHRONISER

In the horizontal position of the recorder, it can be used in combination with slide synchroniser N 6400.
This unit allows slides to be synchronised with speech and music.

3.17. TELEPHONE COIL

With the aid of telephone coil N 6708 (not available in Great Britain), you can record telephone conversations with this recorder. The telephone coil is then connected to the recorder in a similar way as a microphone. In various countries, however, recording of telephone conversations is not permitted by law. Therefore, should you wish to do so, we recommend that you first ask for advice.

CONTROLS AND CONNECTION SOCKETS

Fig. 1

1 = Reel selector switch
2 = Reel spindles with rotatable locking tops
3 = Programme indicator with pre-selector "AUTOSTOP"
4 = Tape tension comparators
5 = Cueing buttons "◁ CUEING" and "CUEING ▷"
6 = Tape slot
7 = Recording level indicator for left channel "LEFT"
8 = Recording level indicator for right channel "RIGHT"
9 = Input selector "TUN TAPE AUX PHON"
10 = Selector for before and after-tape monitoring "A B"
11 = Track selector "1-4 ST 3-2"
12 = Function selector "MP NOR ECHO AMP"
13 = Speed selector "19 9.5 4.75"
14 = Normal/reverse switch "NOR REV"
15 = Speed control for fast winding "FAST MED SLOW"
16 = Start key for reverse operation "◁ LEFT"
17 = Record key "REC"
18 = Pause key "PAUSE"
19 = Start key for forward operation "RIGHT ▷"
20 = Fast rewind key " ◁◁ WIND"
21 = Stop key "STOP"
22 = Fast wind key "WIND ▷▷"
23 = Roller shutter
24 = Socket for stereo or mono (left channel) microphone "MICRO ST L")
25 = Socket for mono microphone (right channel) "MICRO R"
26 = Socket for tape recorder "TAPE"
27 = Socket for headphones "HEADPH"
28 = Microphone recording level control (left channel) "MICRO L"
29 = Microphone recording level control (right channel) "MICRO R"
30 = Recording level control for all other input sources "RECORDING"
31 = Echo/multiplay recording level control "ECHO/MP"
32 = Volume control "VOLUME"
33 = Balance control "BALANCE"
34 = Bass control "BASS"
35 = Treble control "TREBLE"
36 = Push-button for scratch filter "SCRATCH"
37 = Push-button for rumble filter "RUMBLE"
38 = Push-button for physiology filter "PHYS"
39 = Timer "START TIME STOP"
40 = On/off switch for the switching function of the timer "TIMER ON"
41 = Mains switch "MAINS ON"

When the functions "MP", "ECHO" and "AMP" of the function selector (12), position "A" of the before/after-tape monitoring switch (10) and position "REV" of the normal/ reverse switch (14) have been selected, these are indicated by a red illumination of the relevant function. This enables you to see at a glance which function has been chosen.

Fig. 2

42 = Slot for 50-60 Hz adjustment for timer
43 = Socket for remote control "REMOTE"
44 = Socket for loudspeaker enclosure, right channel "LOUDSP R"
45 = Socket for loudspeaker enclosure, left channel "LOUDSP L"
46 = Socket for monitor amplifier "MONITOR"
47 = Socket for record player "PHONO"
48 = Socket for connection of other auxiliary equipment "AUX"
49 = Selector for the socket for record player (47) "CRYST DYN"
50 = Socket for tape recorder "TAPE IN/OUT"
51 = Socket for tuner "TUNER"
52 = Voltage adapter

The numbers of the controls and sockets are repeated throughout the text.
The figures illustrating the text can be found on the separate sheet.

Please, note that copying of gramophone records and recording of radio programmes is only permissible in so far as copyrights or other rights of third parties are not thereby infringed.

PART II "WHAT YOU MUST KNOW"

1. PREPARING THE RECORDER FOR USE

1.1. CARRYING HANDLE

Raising the handle: Press on one side of the handle. The other end is then raised and the handle can be pulled up (Fig. 3).
Folding in the handle: Press down one end of the handle. Then, press on the raised end.

1.2. CONNECTION TO THE MAINS

Place the recorder in the vertical position and take off the lid of the storage compartment in the back by pressing the catches. Take the mains lead out of the storage compartment and, **before inserting the mains plug in the wall socket**, check that the value on the voltage adapter (52) opposite the triangle corresponds to the local mains voltage. Should this not be the case, the adapter must be turned with a coin (anti-clockwise from position 220 or clockwise from position 245) until the correct setting is opposite the triangle and a click is heard (Fig. 2). In this way the recorder can be set to mains voltages of 110 (100 - 120), 127 (115 - 130), 220 (200 - 230) or 240 (230 - 250) Volts.
Except for the timer, (39), switching to 50 or 60 Hz a.c. is not necessary. Now, you may connect the mains lead to the mains socket, since adaptation to the correct mains frequency for the timer should be done while the recorder is switched on.
At the rear of the recorder a slot (42) is located with the indications 50 and 60 Hz on either side. When looking into the recorder through this slot, you see the timer (39).
From the timer a lever protrudes, marked with grey tape at the back. This lever should point towards 50 or 60 Hz depending on the local mains frequency. When changing the mains frequency setting of the timer, the recorder should remain switched on. Insert a thin screwdriver in the slot (42) and push the lever **slowly** to the left or to the right in the desired position until it is felt to engage. Take care that the screwdriver is not inserted too far, to avoid any other parts being touched and damaged.
Note: The lid of the storage compartment has an opening through which the mains lead and connecting leads can be led. This allows the storage compartment to be closed while the recorder is in use.

1.3. OPENING AND REMOVING THE COVER

When using reels of 18 cm dia. (7") or smaller, the cover need not be removed. For larger reels, it must be hinged up completely or taken off. When the recorder is not in use, refit the cover as a protection against dust.
Opening: Open the two catches by pushing them through completely and releasing them. The lower part of the cover can now be hinged with respect to the upper section. It is also possible to hinge up both sections and place them on top of the recorder (Fig. 4).
Removal: Hinge the two parts together and hinge them 90° with respect to the recorder (Fig. 5). The cover can now be pushed to the right out of the hinges.
Refitting: First hinge the two parts together and place the hinge pins on the hinges on top of the recorder. Hold the cover at right angles to the recorder (Fig. 5) and slip it into the hinges towards the left. Swing the two sections of the cover open and, if desired, fasten the catches.

Note: To ensure that the recorder is stable when used in the vertical position, it is fitted with pull-out feet.

1.4. SWITCHING ON AND OFF

Switching on: Press the mains switch (41): the selected functions and the recording-level indicator(s) (7) and/or (8) - depending on the setting of the track selector (11) - are illuminated and the timer (39) is started.
Switching off: Press the mains switch (41) again: the lights extinguish and the timer stops.
Note: Never switch off the recorder while the tape is still running. In that case, first press the stop button (21).

1.5. REEL SELECTOR SWITCH (1)

The reel selector switch (1) should point vertically downwards when using reels with a diameter of 21 cm (8 1/2") or larger (max. 26.5 cm or 10 1/2"). When using reels of 18 cm dia. (7") or smaller, this switch should be turned in the direction of the arrow until a click is heard.
Note: When using reels of different diameters, the largest reel determines the setting of the reel selector switch. However, in that case the speed control for fast winding (15) should not be used.

1.6. THREADING THE TAPE

- Set the reel selector switch (1) to the correct position.
- Place the full reel on the left turntable (when the tape is unwound, the full reel should turn anti-clockwise) and place the empty reel on the right-hand turntable. Ensure that the reels lie perfectly flat on the turntables.
- Pull out the tops of the reel spindles (2), turn them 60° and release them. The reels are now clamped in position on the turntables.
- Unwind approx. 60 cm of tape, hold it taut and feed the tape around the tape tension comparators (4), the guide rollers and through the tape slot (6).
- Keeping the tape taut, insert the leading end between the flanges of the empty reel until the tape touches the hub (Fig. 6).
- Press the tape end onto the reel hub with your fingers through the openings in the reel and turn the reel anti-clockwise until the right-hand reel grips the tape.
- Press the start key "RIGHT ▷" (19) and keep it depressed until the coloured leader tape and the metal switching foil have passed the tape slot (see "AUTOMATIC STOP" 1.10). Then press the stop key (21) and set the programme indicator (3) to "0000" by pressing the zero reset button. On the take-up reel the glossy side should face up and the dull side should face down.

Note: It goes without saying that the tape may also be threaded from right to left. However, for clarity, we have described one direction only.

1.7. FUNCTION SELECTOR (12)

With function selector (12) the recorder can be set to four different functions:
"MP" (red) for multiplay recordings;
"NOR" for (normal) use of the recording section (including the tape transport) plus the amplifier section;
ECHO (red) for echo or reverberation recordings (only possible during recording);
"AMP" (red) (amplifier) when using the amplifier section only. **In this position the tape-transport section is completely switched off**; the keys for tape transport (16 ... 22) are

inoperative. During normal tape transport or fast winding, the function selector may be set to position "AMP" without any risk of damaging the recorder: the effect is the same as when the stop button (21) is depressed.

1.8. SPEED SELECTOR (13)

The desired tape speed can be set with the speed selector (13): 19, 9.5 or 4.75 cm/sec. The lowest speed gives the longest playing time and the highest speed the best sound quality.

1.9. TRACK SELECTOR (11)

The right head-system operates when the tape runs to the right and covers tracks 1 and/or 3. The left head-system is operative when the tape runs to the left and covers tracks 2 and/or 4.
"**1-4**" (mono) When the tape runs to the right, track 1 is to be used and when it runs to the left track 4. Recording level indicator (7) "LEFT" is illuminated.
"**ST**" (stereo) When the tape runs to the right tracks 1 (left channel) and 3 (right channel) are used. When the tape runs to the left, you use tracks 4 (left channel) and 2 (right channel). Both recording level indicators (7) "LEFT" (left channel) and (8) "RIGHT" (right channel) are illuminated.
"**3-2**" (mono) When the tape runs to the right, you use track 3 and when it runs to the left track 2. Recording level indicator "RIGHT" (8) is illuminated.

1.10. AUTOMATIC STOP

At each end of the tape a piece of metal switching foil has been inserted between the coloured leader tape and the magnetic tape. This switching foil can perform a switching function when passing certain contacts in the tape slot. The switching function is determined by the position of the normal/reverse switch (14) (1.11.).

1.11. NORMAL/REVERSE SWITCH (14)

With the normal/reverse switch (14), the switching function of the strips of switching foil at each tape end can be selected.
"**NOR**": the tape stops automatically both when the tape runs to the left and to the right;
"**REV**": (red) at the end of the tape transport **to the right** the recorder automatically changes over to tape transport to the left. At the end of the tape transport to the left the tape stops automatically.

Notes:
1. Both functions can be used during recording as well as playback.
2. The reverse function is performed only at the end of tape transport to the right. If continuous reversal is desired, please consult your dealer.

1.12. PROGRAMME INDICATOR WITH PRE-SELECTOR "AUTOSTOP" (3)

Make it a habit to reset the programme indicator to "0000" immediately after threading the tape, by pushing the zero-reset button. The programme indicator does not give an indication as to the length or playing time of the tape: it merely counts the number of revolutions of the left-hand turntable.
Make a note of the position of the programme indicator at the beginning of each recording on the index label of the tape storage box. If you wish to rapidly locate a certain recording, set the previously noted programme indicator reading with the knurled rings of the "AUTOSTOP" pre-selector. To switch on the pre-selector, press the switch at the left. The tape will then stop automatically on reaching the preset position during playback or fast winding.

Notes:
1. To prevent erroneous interruptions during recording, the pre-selector is inoperative during recording.
2. During fast winding with large reels, it should be taken into account that a large reel has a greater inertia and cannot be braked abruptly. Therefore, when using the pre-selector during fast winding, the tape will overshoot the preset position. To overcome this problem, it is advised to advance the pre-selector slightly (approx. 15 units) compared with the noted programme indicator reading. This method may also be adopted to stop the tape exactly at the beginning or end of the tape.

1.13. TIP-TOUCH KEYS (16 ... 22)

"**RIGHT ▷**" **(19)** = start key for starting tape transport to the right, both for playback and recording (in combination with record key "REC" (17)).
Tape transport is stopped by pressing the stop key "STOP" (21) or by selecting another tape transport function.
During recording the recording function is **not** switched off by pressing the key " ◁ LEFT" (16).
" **◁ LEFT" (16)** = start key for tape transport to the left during playback and recording (in combination with record key (17).
Tape transport is stopped by pressing the stop key "STOP" (21), or by selecting another tape transport function.
During recording the recording function is not switched off by pressing the key "RIGHT ▷ " (19).
"**WIND ▷▷** " **(22)** = key for fast winding to the right.
Fast winding is stopped by pressing the stop key "STOP" (21) or by selecting another tape transport function.
" **◁◁ WIND" (20)** = key for fast winding to the left.
Fast winding is discontinued by pressing the stop key "STOP" (21) or by selecting another tape transport function.
"**PAUSE" (18)** = pause key for short interruptions during recording or playback. To continue, just press the appropriate start key. The recording function, if selected, then remains switched on.
The pause key is inoperative during fast winding.
"**REC" (17)** = record key.
The record key should always be pressed simultaneously with another key:
a. simultaneously with the pause key (18) to prepare for recording; to start the recording you can then press the appropriate start key (16 or 19), without disabling the recording function.
b. simultaneously with one of the start keys for tape transport (19 "RIGHT ▷" or 16 " ◁LEFT"). If during recording in position recording/pause the other, not illuminated start key for tape transport is pressed, the recording function is not switched off and recording is continued in the other direction.
The recording function is switched off by pressing the stop key (21) or one of the fast wind keys (20 or 22).
"**STOP" (21)** = stop key for switching off all tape transport functions. The stop key is not illuminated after it is pressed.

Note: The tip-touch keys are inoperative when the function selector (12) is set to "AMP".

1.14. CUEING BUTTONS (5)

If you depress the cueing button (5) which corresponds to the direction of the recording, the tape is positioned against the playback head and the recording becomes audible. This permits you to stop the tape at the correct point.
With button "◁ CUEING" the tape is pressed against the left head system for tracks 1 and/or 3. However, cueing is possible only when the relevant head system is operative: for "◁ CUEING" the corresponding start key for tape transport to the left (16) "◁ LEFT" should be illuminated (dimly); for "CUEING ▷" the corresponding start key for tape transport to the right (19) "RIGHT ▷" should be lit (dimly). When the wrong start key for tape transport is illuminated, briefly press the correct key, allow the tape to start and immediately after this press the stop key (21).
The speed control (15) for fast winding can also be used during cueing; this will make it easier for you to recognise the sounds.
When using the cueing buttons while the tape is manually turned, also press the pause key (18): the sound is then better audible.

1.15. SPEED CONTROL FOR FAST WINDING (15)

With speed control (15) you can adjust the winding speed during fast winding. Slide the speed control from "FAST" to "MED" (medium) or "SLOW" if you want to reduce the winding speed. The speed control springs back to position "FAST" when released. This control can be used in combination with, for example, the cueing buttons (5) or the pre-selector "AUTOSTOP" (3).
Note: This speed control should **not** be used during fast winding with reels of different diameter. This may give rise to looping, thus damaging the tape.

1.16. TIMER (39)

With the timer (39) you can start and stop the playback and recording functions at preset times. The time can be set with the knurled rings: first set the hours (left) and then the minutes (right). The rings for setting the minutes for the start and stop function are blocked in position 58. This means that they cannot be turned from the 58th minute to the 60th minute.
The timer is started when the recorder is switched on with the mains switch (41).
The switching function of the timer is switched on by pressing switch (40): the timer is then illuminated. The switching function is made inoperative by pressing switch (40) again: the timer light then extinguishes.
"TIME": this section is the electrical clock on which the correct time can be set. The clock is started when the recorder is switched on.
"START": here, the starting time of recording or playback can be set. Switch (40) should be depressed and the recorder should be set to recording or playback. With the pause key (18) the recorder should be set to the pause position, and the key for the direction of tape transport (16 or 19) and, if applicable, the record key (17) should also be illuminated. The tape recorder and e.g. the tuner from which the recording is to be made should remain switched on.
"STOP": here, the time can be set at which recording or playback should stop. The recorder remains switched on.

Note: The max. deviation when starting and stopping the tape with the timer is + or −2 mins. Allowance should be made for this when setting the start and stop time.

2. CONNECTION SOCKETS

The recorder is provided with two connection panels. Under the roller shutter (23) at the front of the recorder four connection sockets are located which, as a rule, will only be used temporarily: two microphone sockets (24 and 25), a headphone socket (27) and an additional socket for connection of a tape recorder (26).
In the storage compartment at the rear of the recorder the connection sockets are located which will usually remain connected, e.g. socket for tuner (51) or loudspeaker enclosures (44 and 45). The various connection sockets may be divided into inputs, outputs and combined inputs and outputs.
The **inputs** can only be used for recording purposes or for amplification: the sockets for microphones (24 and 25), tuner (51), record player (47) and auxiliary equipment ("AUX", 48).
The **outputs** can be used for sound reproduction only: sockets for monitor amplifier (46), headphones (26) and loudspeaker enclosures (44 and 45).
The **combined inputs/outputs** can be used for recording and amplification or for playing back: tape-recorder sockets (26 and 50).
All sound sources may remain connected simultaneously.

2.1. INPUT SELECTOR (9)

With the input selector (9) you can select the input that you wish to use for recording or reproducing via the amplifier section. When playing back a tape with the recorder section, the position of the input selector does not matter.
The following positions can be selected:
"TUN": input for tuner (51)
"TAPE": one of the two "TAPE" inputs (26 or 50) (recording and playback). That input is used to which a **switched-on** apparatus is connected. If the signal to be recorded appears to be too weak, remove the plug from the other "TAPE" socket.
"AUX": auxiliary input (48)
"PHONE": record player input (47).
Independently of the position of the input selector you can make microphone recordings if a microphone is connected. However, if you do not wish to make mixed recordings, check that the other equipment connected to the recorder is switched off or that the recording level control (30) is set to "0".

2.2. CONNECTION

Connection socket for a stereo or mono microphone "MICRO ST L" (24)
(under shutter 23) for connection of:
a. a stereo microphone for stereo recordings "MICRO **ST**". In this case no microphone may be connected to socket (25). Adjust the recording level with the two microphone recording level controls (28 and 29);
b. a mono microphone for the left channel in the case of stereo recordings "MICRO **L**";
c. a mono microphone for mono recordings.
When using a mono microphone, adjust the recording level with the microphone recording level control (28).

Connection socket for a mono microphone "MICRO R" (25)
(under shutter 23), for connecting:
a. a mono microphone for the right-hand channel in the case of stereo recordings "MICRO **R**";

b. a mono microphone for mono recordings.
In both cases adjust the recording level with control (29).

Notes:
1. Telephone coil N 6708 is connected in the same way as a mono microphone.
2. The microphone leads can be extended by means of connection/extension lead 4822 321 20211.

When the equipment to be connected is not provided with a connecting lead with plug, use stereo connection lead EL 3768/14.
For connection to equipment not fitted with DIN connections, adapter leads and plugs are available.

Connection sockets for tape recorders (26 and 50) (input/output)
"TAPE" (26) under shutter 23), intended as temporary connection facility.
"TAPE IN/OUT" (50) (in storage compartment), intended as permanent connection facility.
Both connection sockets are fully identical and can be used as input or output. Both sockets serve in the first place as connections for a tape recorder (open-reel or cassette recorder). However, they may also be used for connecting any other apparatus provided with a so-called "diode" or tape recorder connection.

Note: The **output signal** is only available on both "TAPE" sockets when the N 4450 is set to playback of a tape programme with input selector (9) in position "TAPE". However, if during recording the signal at the same time is to be recorded on another recorder or is to be applied to an external amplifier, connect the relevant apparatus to the "MONITOR" socket (46).

Socket for record player "PHONO" (47) (input)
For connection of a record player. This input is, via selector switch (49), adaptable for any record player, no matter the type of pick-up cartridge used.

Selector (49) for "PHONO" socket (47)
This selector serves to adapt the "PHONO" input (47) to record players with different types of cartridge:
"DYN": in this position the "PHONO" socket (47) is suited for record players with a **Hi-Fi pick-up cartridge (dynamic or ceramic) without built-in preamplifier.**
"CRYST": in this position the "PHONO" socket (47) is suitable for:
a. record players with a **crystal** or (normal) **ceramic** pick-up cartridge;
b. record players **with built-in preamplifier for Hi-Fi pick-up cartridge (dynamic or ceramic).**
Record players mentioned under **a.** and **b.** may also be connected to the "AUX" socket (48). Switch (49) only operates the "PHONO" socket (47).
Note: Record players with built-in output amplifier provided with a tape recorder connection must be connected to the "AUX" socket (48) or one of the "TAPE" sockets (26 or 50).

Connection socket for tuner "TUNER" (51) (input)
For connection of a tuner. Normal radios and tuner/amplifier combinations must be connected to one of the "TAPE" sockets (26 or 50) (input/output) or the "AUX" input (48).

Auxiliary socket "AUX" (48) (input)
For connection of other than the usual input sources, e.g. an electronic organ or an electric guitar. However, first check that the output voltage of the apparatus to be connected and the input sensitivity of the "AUX" input correspond.
The input may also be used to connect a normal radio set, a tuner-amplifier combination (receiver) etc. Record players that may be connected to the "PHONO" socket (47) **in position "CRYST" of switch (49)**, may also be connected to the "AUX" input socket. Switch (49) operates the "PHONO" input (47) only.

Connection socket for monitor amplifier "MONITOR" (46) (output)
For connection of a monitor amplifier. The socket always supplies a signal, both during playback, recording and when using the amplifier section. This allows it to be used for connecting another tape recorder (duplicating) or an external (monitor) amplifier. (During recording and when using the amplifier section the "TAPE" **outputs** (26 and 50) are blocked.)

Connection sockets for loudspeaker enclosures "LOUDSP R" (44) and "LOUDSP L" (45)
These sockets serve for connecting the loudspeaker enclosures for the right channel (socket 44) and for the left channel (socket 45). The enclosures should have an impedance between 4 and 8 ohms.

Connection socket for stereo headphones "HEADPH" (27)
This socket has two connection possibilities:
a. with the protrusion on the plug opposite the white dot at bottom left: the loudspeaker enclosures are new muted;
b. with the protrusion on the plug turned half a turn (180°) further than under a.: the loudspeaker enclosures remain switched on.

Socket for remote control "REMOTE" (43)
For connection of remote control unit N 6719 (optional extra). Switch off the recorder with the mains switch (41), when connecting the remote control unit. The recorder may otherwise be switched to an undesired function.

3. RECORDING

3.1. USING MICROPHONES

Stereo recordings can be made with two mono microphones or with one stereo microphone, which in fact also consists of two separate mono microphones (microphone sections).
Mono recordings can be made with one mono microphone (or with two mono microphones when using connection/extension lead 4822 321 20211).
Do not place the microphone(s) too close to the recorder, preferably not on the same table, to prevent unwanted noise produced by the recorder being picked up by the microphone(s).
In the case of stereo recordings, the microphone(s) should be placed so that the microphone (or microphone section) for the left channel must be directed towards the left of the sound source(s) to be recorded and that for the right-hand channel towards the right.
Both for mono and stereo recordings of music, singing etc. the most suitable distance between microphone(s) and sound

source(s) can be determined by making test recordings.
The best distance between mouth and microphone when recording speech is approx. 30 cm.
The stereo effect becomes more marked as the left and right portions of the sound source are placed further apart or the microphones are placed closer to the relevant part of the sound source.
The acoustics of the room where the recording is made also determines the quality of the recording.
For example, if you record speech in a space with large reflecting surfaces, such as big windows and bare walls, this results in annoying reverberation in the recording. This may be prevented by speaking closer to the microphone or by drawing the curtains or covering the walls. However, when recording music (instrumental or vocal), reverberation is necessary to make the recording sound natural. In this case there is of course no need to draw the curtains.
This recorder also has a facility to add echo or reverberation to a recording. Furthermore, it is possible to mix recordings from a microphone and e.g. a record player.

3.2. RECORDING LEVEL

The quality of a recording is determined by the intensity with which the sound is recorded on the tape: the so-called recording level. Also when using the amplifier section (function selector 12 in position "AMP") the reproduction quality depends on the setting of the recording level.

- The recording level is adjusted with the recording level controls (28 . . . 31) and can be checked with recording level indicators (7) and/or (8). Depending on the setting of the track selector (11), either one (mono) or two (stereo) recording level indicators are operative. The scale of each indicator is graduated in per cent and decibels –dB– (a unit of volume).
- The recording level is correct when the pointers of the recording level indicators deflect to 100 % at the loudest passages of the recording (Fig. 8). If the recording level is set too low, too much "noise" will be audible during playback; if the recording level is too high, distortion will result.
- Bear in mind that the recording level should also be set when using the amplifier section.

3.3. SELECTOR FOR BEFORE/AFTER TAPE MONITORING (10)

"A" (red): this is the position for after-tape monitoring. During recording, while the tape is running, the signal which has just been recorded on the tape is reproduced via the playback head. Thus, you hear the sound as it has been recorded on the tape. **NB**: In position "A" with stationary tape (position recording/pause) the playback head supplies no signal so that you will not hear anything.
"B": this is the position for before-tape monitoring. The signal is monitored before it is recorded on the tape via the recording head. When the tape is not running (in position recording/pause), you can consequently hear the signal to be recorded.

3.4. MONITORING DURING RECORDING

To check the sound to be recorded, you can listen in during recording via the loudspeaker enclosures or headphones. When making microphone recordings it is necessary to use headphones, in order to prevent the sound radiated by the loudspeakers being picked up by the microphone(s) ("acoustic feedback").
When monitoring via the headphones as well as the loudspeaker enclosures, you may choose between before and after-tape monitoring (Chapt. 3.3.)

a. Monitoring via headphones

You can monitor your recordings in stereo or mono with the aid of the Philips' headphones LBB 9902/00 or N 6302.

- Connect the headphones in the desired position to socket (27) at the front of the recorder.
- Set the before/after-tape switch (10) to the correct position.
- Adjust the headphone volume with volume control (32), the balance with balance control (33) and tone with controls (34) and (35).

b. Monitoring via loudspeaker enclosures

- Adjust the volume as required with volume control (32), the tone with the tone controls (34 and 35) and, in stereo programmes, the relative volume with the balance control (33). If "howling" occurs when using the microphones, slide down the volume control (32) or place the microphones farther from the recorder.
- Set switch 10 to "B" or "A" for before or after tape monitoring.

3.5. RECORDING

Introduction

- During recording any previous recording on the same part of the tape is automatically erased.
- The setting of the volume and tone controls of a radio etc. with recorder connection does not affect the recording.
- When making microphone recordings switch off the other sound sources or set recording level control (30) to "0" if you do not want a mixed recording.
- When not monitoring during microphone recordings, set volume control (32) to "0", or if monitoring is desired, use headphones in order to avoid "acoustic feedback".
- The recording level may be set before recording is started; if this is not possible, this may also be done during recording.

Recording

- For microphone recordings connect the microphone(s) and check that recording level control (30) is set to "0". The setting of the input selector (9) does not matter.
- For other recordings, make sure that the relevant audio source is connected and that the input selector (9) is in the correct position.
- Set the normal/reverse switch (14) to the desired position.
- Check that function selector (12) is in position "NOR".
- Set the before/after tape switch (10) to position "B".
- Set the speed selector (13) to the desired position.
- Set the track selector (11) to position "ST" for stereo recordings and to position 1-4 or 3-2 for mono recordings.
- Note the reading of programme indicator (3) or set the programme indicator to "0000" by pressing the zero-reset button.
- Set the recorder to position recording/pause by simultaneously pressing the record key (17) and the pause key (18).
- Speak or sing into the microphones or switch on the audio source. Adjust the recording level by sliding up the appropriate recording level control(s) until the pointer(s) of the recording level indicator(s) (7) and/or (8) deflect to 100 %.

- If you wish to listen in during recording, you may now adjust volume, balance and tone with controls 32. . . 35.
- To start the recording, press the appropriate start key for tape transport (16 or 19). Occasionally check the recording level and, if necessary, readjust it gradually.
- As long as the tape is running, you may choose between before and after-tape monitoring (switch 10).
- For brief interruptions press the pause key (18). Monitoring is now possible only in position "B" of the before/after-tape monitoring switch (10).
- To stop recording, press the stop key (21). If desired, you may also press one of the fast wind keys (20 or 22).

Note: If during recording (with running tape) the other start key for tape transport is pressed, the recording function is **not** switched off. The recorder then continues recording in the other direction.

3.6. ERASING WITHOUT RECORDING

During recording any previous recording on the same part of the tape is automatically erased. A recording may also be erased without recording over it:

- Set speed selector (13) to "19" (to speed up erasing).
- Set track selector (11) to "ST", "1-4" or "3-2", depending on the tracks to be erased. (In position "ST" two tracks, 1 and 3 or 4 and 2 are erased at the same time; in position "1-4" or "3-2" one track is erased at a time).
- Set all recording level controls (28 . . . 31) to "0".
- Press one of the start keys for tape transport (16 or 19) together with the record key (17).
- To stop, press stop key (21).

4. PLAYING BACK AND USING THE AMPLIFIER SECTION

4.1. THE AMPLIFIER

The built-in Hi-Fi stereo amplifier meets Hi-Fi standard DIN 45 500 and supplies 2 x 20 W of continuous power (2 x 30 W music power).
The volume is adjusted with control (32) "VOLUME".
The balance between left and right channel during stereo reproduction is adjusted with control (33) "BALANCE".
The bass tones are adjusted with control (34) "BASS".
Treble can be adjusted with control (35) "TREBLE".
At low volume (volume control 32) you may depress the contour switch (39) "PHYS" (physiology): the low and high notes are then additionally boosted. This is because at low sound level the human ear is less sensitive to the treble and bass tones. When using a record player the noise filter (36) "SCRATCH" or the rumble filter (37) "RUMBLE" may be switched in by pressing the relevant switches.
"Scratch" is disturbing noise in the treble range, occurring when playing an old and worn record. "Rumble" is a disturbing sound in the bass range caused by mechanical vibrations of the record player or vibrations from outside.
You can listen to the amplifier via two loudspeaker enclosures and/or via stereo headphones; volume etc. can be adjusted with the same controls in both cases.

a. Via two loudspeaker enclosures (4-8 ohm)

Connect the enclosures to sockets (44) and (45). The loudspeaker enclosure connected to socket (45) reproduces the left-hand channel of a stereo recording and that connected to socket (44) the right-hand channel.
Place the loudspeaker enclosure for the left channel to your left and that for the right channel to your right. In general, the best listening position is in the middle in front of the loudspeaker enclosures, so that the distance from the listener to each enclosure equals the distance between the enclosures. However, it may be necessary to do some experimenting to find the best enclosure arrangement as the sound reproduction may be influenced by the acoustic properties of the room.
By sliding the balance control (33) up or down from position "0", the reproduced sound of a stereo recording can be made to resemble the original sound impression as closely as possible. In the case of a mono recording, the sound is reproduced at the same volume by both loudspeaker enclosures in position "0" of the balance control.
If desired one of the loudspeaker enclosures may then be muted completely by sliding the balance control completely upwards or downwards, depending on the loudspeaker enclosure to be switched off.

b. Via stereo headphones

The headphones should be connected in the desired position to socket (27) under the shutter (23) at the front of the recorder.

c. Via a monitor amplifier

An additional amplifier can be connected to socket "MONITOR" (46). Volume etc. can then be adjusted on the external amplifier. The volume controls etc. of N 4450 do not affect the output signal on the "MONITOR" socket (46).

4.2. PLAYING BACK A TAPE PROGRAMME

- Check that the function selector (12) is in position "NOR".
- During playback the position of the before/after tape switch (10) is not important.
- Set the speed selector (13) to the speed at which the recording has been made.
- Set the track selector (11) to the position in which the recording has been made.
- Set the normal/reverse switch (14) to the desired position.
- Start playback by pressing the appropriate start key for tape transport (16) or (19).
- Adjust the volume etc. with the relevant controls (see Chapter 4.1.).
- To stop playing back, press stop key (21).
- If you wish to proceed at once to fast winding, tape transport in the opposite direction or recording, you may simply press the relevant keys, without having to press the stop key (21) first.

4.3. USING N 4450 AS AN AMPLIFIER

When the function selector (12) is in position "AMP", only the amplifier section of the recorder is operative.
The three motors of the tape deck are then switched off and the keys for the tape transport functions (16 . . . 22) are inoperative. If during tape transport you wish to change over to the amplifier section, the function selector (12) may be simply set from "NOR" to "AMP" while the tape is running. The effect is the same as when pressing the stop key (21).
The amplifier section can form the centre of your stereo installation, i.e. it may be used in combination with e.g. a record player or tuner, without the need to make a recording.

- Check that the relevant signal source is connected to the correct socket.

- Set the track selector (11) to position "ST" (stereo).
- Set the input selector (9) to the correct position.
- Make sure that the function selector (12) has been set to "AMP".
- Adjust the recording level with recording level control (30) and check this with recording level indicators (7) and/or (8).
- Adjust the volume etc. with the appropriate controls (also see Chapter 4.1.).
- To stop reproduction, switch off N 4450 with the mains switch (41); do not forget to switch off the external equipment (e.g. tuner) as well.
- If you wish to make a recording (e.g. from tuner) while using the amplifier section, set the function selector (12) to "NOR" and press the record key (17) simultaneously with the appropriate start key for tape transport (16 or 19).

5. SPECIAL FACILITIES

5.1. MIXING SOUNDS

This recorder permits of simultaneously making a recording from e.g. a record player and microphone. Thus, you may for example record gramophone records and anounce them yourself via the microphone. You can adjust the mixing ratio yourself. In the case of mixed recordings, the illuminated recording level indicator(s) indicate(s) the sum of the recording levels.
The mixing ratio can be checked by monitoring during recording. Preferably use headphones for this, in order to avoid "acoustic feedback".

5.2. MULTIPLAY

Note: When repeatedly copying a recording, the quality of sound will deteriorate (so-called transfer loss). To minimise this loss of quality it is advisable to use the highest tape speed and to record the main part (e.g. melody) at the end.
The recording level of the **new recording** is adjusted with one of the recording level controls (28, 29 or 30). The recording level of the recording **to be duplicated** should be adjusted with the multiplay recording level control (31).
For monitoring in the case of multiplay recordings with a microphone, preferably use headphones to avoid acoustic feedback. Adjust the volume etc. for the headphones with controls 32 . . . 35.
To make a three-part recording with e.g. a microphone and the tape running to the right, proceed as follows.

First run: Recording the first part on track 1.

- Connect the headphones to socket (27) and the microphone to socket (24) or (25).
- Set the before/after-tape switch (10) to position "B".
- Set the function selector (12) to "NOR".
- Set the speed selector (13) preferably to "19" (in view of transfer loss).
- Set the track selector (11) to 1-4.
- Note the reading of programme indicator (3) or set the programme indicator to "0000" with the zero-reset button.
- Make the microphone recording on track 1.
- When monitoring via the headphones during recording, you hear the signal in both earshells.
- After recording, rewind the tape as far as the beginning.

Second run: Transferring the first part from track 1 to track 3, simultaneously adding the second part.

- Set the track selector (11) to 3-2.
- Set the function selector (12) to "MP" (multiplay).

The recording level of the **new recording** (second part) is adjusted with one of the microphone recording level controls (28) or (29).
The recording level of the **recording to be transferred** (first part) is adjusted with multiplay recording level control (31). However, adjust the recording level of the **new recording** below normal, as the multiplay signal also has to be added **during recording.**
It is obvious that the multiplay recording level can be adjusted during recording only. The illuminated recording level indicator indicates the sum of the two signals. Of course, this sum should not exceed 100 %.

- Make the second microphone recording on track 3, simultaneously adding the first part. The original recording on track 1 is not erased, so that the second run may be repeated if the result is not satisfactory. During recording you hear the new recording in the left earshell of the headphones and the recording to be transferred in the right earshell.
- Rewind the tape to the beginning of the recording.

The first and second part are now on track 3.

Third run: Transferring the first and second parts from track 3 to track 1, while adding the third part.

- Set the track selector (11) to 1-4.
- Leave the function selector (12) in position "MP".

Further proceed as for the second run. After the third run, the first, second and third runs are on track 1. The recording of the second run on track 3 is not erased and the third run may be repeated of the result is not satisfactory.
If desired you may proceed with a fourth and fifth run, but you should take into account the above-stated "transfer loss".
Playing back is possible by leaving the track selector (11) in the last position. If desired, you can also erase the last but one recording (see Chapter 3.6.).

5.3. ECHO AND REVERBERATION

To make recordings with echo or reverberation, proceed as follows:

- Set the function selector (12) to "ECHO".
- Set the speed selector (13) to "4.75" or "9.5" for echo recordings and to "19" for reverberation recordings.
- Further proceed in the same way as for a normal recording.

Adjust the recording level of the actual recording to a lower level, as the echo or reverberation has to be added. Adjust the echo or reverberation level with echo recording level control (31). The sum of the two levels can be checked on the recording level indicator(s) (7) and/or (8) and should not exceed 100%.

6. SPLICING JIG

After removing the cover below the tape slot (pull forwards), you see the built-in splicing jig for editing and splicing the tape (Fig. 9). It may occur, for example, that you wish to remove a certain passage from a recording or link different passages.
However, take into account that if the other tracks have also been used, these may be damaged by cutting and splicing.

For splicing use special splicing tape. You can also use the Philips' splicing kit SK10.
Proceed as follows :

- Pull the cover below the tape slot forwards.
- Open the two black tape clips (Fig. 9).
- Insert the correct part of the tape in the jig and close the clips. The side of the tape facing the heads (dull side) should face downwards. During splicing the reels need not be removed from the recorder.
- Cut the parts to be removed by inserting a non-magnetic tape-cutter in the diagonal guide slot (an oblique splice is not audible during playback).
- Place the ends to be spliced accurately against each other,
- Apply a piece of adhesive tape of approx. 2 cm across the ends. Check that the adhesive tape does not overlap the magnetic tape; if necessary, cut off the protruding part.

Note: Take care that no pieces of tape drop into the recorder during splicing: this may disturb the correct working of the recorder.

7. REMOTE CONTROL

The N 4450 tape recorder can also be remote controlled with the aid of remote control unit N 6719 (separately available). Connect the remote control unit to the "REMOTE" socket (43) with the recorder switched off, as otherwise the recorder might be set to an undesired function.

8. CONTINUOUS TAPE REEL

The continuous tape reel EL 1907/52 (CE 10) can also be mounted on the recorder.
The recorder can then be used for recording and playback with the continuous tape reel (also in the vertical position).

- Remove the ornamental screw between the reel discs of the recorder. In the top-left corner of the storage compartment, a screw with a round, black head is fitted; pull out this screw.
- Place the continuous tape reel over the hole for the ornamental screw and fit the special screw in this hole through the hole in the reel. The special screw should not be tightened too firmly.
- The endless tape reel can now be used for recording and playback, **but only for tape transport to the right**: tape transport to the left will damage the continuous tape reel beyond repair. Fast winding is not possible with a continous tape reel.

Note: The reel discs of the recorder also rotate when using the continuous tape reel, but this is of no consequence.

9. SLIDE SYNCHRONISER

The recorder may also be used in conjunction with slide synchroniser N 6400, for synchronising slides with speech and music. The recorder should then be used in the horizontal position and the slide synchroniser should be placed to the left or right of the recorder.
For a correct synchronisation, the slide synchroniser should be in the same place during recording and playback.

10. MAINTENANCE

When normally used your tape recorder requires no special attention. However, it is advisable to remove occassionally the dust and dirt collected on the heads, since this may adversely affect the sound quality, especially the treble tones and playback volume.
We therefore recommend that you clean the heads from time to time by playing back the Philips cleaning tape, type 811/CT. This tape should be replayed in the same way as a normal audio tape in position playback. After playing the cleaning tape, the heads will be clean. This should be done after approx. 50 hours of use, or on the average, once a month.
However, if the heads are very dirty, proceed as follows:

- Check that the recorder is disconnected from the mains.
- Remove the head cover above the tape slot and the cover below the tape slot by pulling them forwards.
- Clean with one of the cleaning swabs supplied with the recorder: the tape tension comparators (4), the guide rollers (A), the tape guides (C), the front of the heads (D, E, F), the capstans (B) and both rubber pressure rollers (Fig. 10). If the dirt is persistent, you may moisten the cleaning swab with some alcohol or methylated spirit. Never use any other cleaning agents than those mentioned above and do not touch the heads with sharp or metal objects.
- **The drive mechanism should not be lubricated.**
- Allow all parts to dry before refitting the head cover and connecting the recorder to the mains.

Furthermore, we recommend that you have your recorder checked by your dealer at regular intervals, for instance once a year or in the case of very intensive use at shorter intervals. Your dealer will clean, check and, if necessary readjust the recorder, and parts that are subject to wear will then be replaced in due time.

Storage of tapes

Put the tape in its box immediately after use. It is then protected against dust and dirt and can be easily taken along. Store the tapes at room temperature, not near loudspeakers or transformers, and not in the sun.

PART III. GENERAL INFORMATION

1. OPTIONAL ACCESSORIES

For this recorder an extensive range of accessories are available. These permit you to make full use of your recorder.

- Long-play, double-play and triple-play tape on various sizes of reels. Thus, you can buy tape in the quantity which best suits your needs. Empty reels are also available.
- Various types of microphones.
- Stereo connecting lead EL 3768/14 for connecting equipment with DIN sockets.
- Hi-Fi loudspeaker boxes 22 RH 413, 22 RH 493, 22 RH 496, 22 RH 497 and 22 RH 499.
- Remote control unit N 6719.
- Splicing kit SK 10 which includes: leader tape in various colours, switching foil, adhesive tape, splicing jig, cutter, and self-adhesive labels.
- Connection/extension lead 4822 321 20211, for mono and stereo recordings with two microphones and/or extending microphone leads.
- Telephone coil N 6708, for recording telephone conversations (not available in Great Britain).
- Hi-Fi stereo headphones LBB 9902 or N 6302 for monitoring during recording and for reproducing without disturbing others.
- Cleaning tape 811/CT
- Slide synchroniser N 6400, for synchronising slides with speech and music. (Possible only when the recorder is used in the horizontal position).
- Continuous tape reel EL 1907/52 (CE 10) for continually repeating a programme, e.g. commercials in department stores and supermarkets.
- Adapter leads and adapter plugs for connecting equipment not fitted with DIN sockets.

Note: All these accessories will not necessarily always be available in all countries.

2. INPUTS AND OUTPUTS

The pin numbers are given near the pins of the plugs. Pins that are not mentioned are free.

MICRO L + ST socket (24): for 3 or 5-pin 180° DIN plug
sensitivity for stereo recording: 0.1 mV/2 kohms
sensitivity for mono recording with one microphone: 0.2 mV/2 kohms
pin 1 = left, pin 4 = right, pin 2 = earth.

MICRO R socket (25): for 3 or 5-pin 180° DIN plug
sensitivity for stereo recording: 0.1 mV/2 kohms
sensitivity for mono recording with one microphone: 0.2 mV/2 kohms.
pins 1 and 4 = right (connected to pin 4 of socket 24),
pin 2 = earth.

TAPE IN/OUT sockets (26) and (50): for 5-pin 180° DIN plug
input sensitivity: pins 1 and 4: 2 mV/20 kohms
input sensitivity: pins 3 and 5: 100 mV/1 Mohm
output voltage: pins 3 and 5 *): 1 V/50 kohms
pin 1 = left, pin 4 = right, pin 2 = earth, pin 5 = right, pin 3 = left.

HEADPH socket (27): for 5-pin 360° DIN plug
output voltage: max. 3 V/400-600 ohms
pin 4 = left, pins 2 and 3 = earth, pin 5 = right.

TUN socket (51): for 5-pin 180° DIN plug
input sensitivity: 100 mV/100 kohms
pin 2 = earth, pin 5 = right, pin 3 = left.

PHONO socket (47): for 5-pin 180° DIN plug
input sensitivity "CRYST": 100 mV/1 Mohm
input sensitivity "DYN": 1.5 mV/47 kohms
pin 2 = earth, pins 5 and 1 = right, pin 3 = left.

AUX socket (48): for 5-pin 180° DIN plug
input sensitivity pins 1 and 4: 2 mV/20 kohms
input sensitivity pins 3 and 5: 100 mV/1 Mohm
pin 1 = left, pin 4 = right, pin 2 = earth, pin 5 = right, pin 3 = left.

MONITOR socket (46): for 5-pin 180° DIN plug
output voltage: 1 V/50 kohms
pin 2 = earth, pin 5 = right, pin 3 = left,

LOUDSP L + R sockets (45) and (44): for 2-pin DIN loudspeaker plugs
impedance: 4 to 8 ohms
round thin pin = signal side ("+"), broad, flat pin = screening ("–").

REMOTE socket (43): for 10-pin remote control plug
pin 1 = recording (REC), pin 2= stop (STOP), pin 3 = fast winding to the left (◁◁WIND), pin 4 = fast winding to the right (WIND▷▷, pin 5 = pause (PAUSE), pin 6 = earth, pin 7 = "memory" for illumination of the start keys for tape transport "◁ LEFT" or "RIGHT ▷" (16 or 19) in stop or pause position or during fast winding; pin 8 = tape transport to the right (RIGHT ▷), pin 9 = power supply (–25 V), pin 10 = tape transport to the left (◁ LEFT),

*) The **output signal** on pins 3 and 5 of the TAPE sockets (26 and 50) is only available when the N 4450 is set to playback of a tape programme with input selector (9) in position "TAPE".
The "MONITOR" socket (46), however, always carries an outgoing signal, both during recording, playing back and use of the amplifier section.

3. TECHNICAL DATA

(subject to change without notice)

- Adjustable to mains voltages of 110 (100 - 120), 127 (115 - 130), 220 (200 - 230) and 240 (230 - 250) Volts with voltage adapter (52).
- Suited for 50 and 60 Hz alternating voltage. Only the timer (39) should be set to 50 or 60 Hz.
- Accepts reels with a diameter up to 26.5 cm (10 1/2").
- Tape width 6.25 mm (1/4").
- Four-track system.
- Track configuration in accordance with IEC standards.
- Three tape speeds: 19, 9.5 and 4.75 cm/sec.
- Max. playing time (stereo) with 1080 m tape (26.5 cm reel with LP tape) at 19 cm/sec: 2x1 1/2 hours (reverse).
- Fast winding: 1080 m tape (26.5 cm reel with LP tape) within 250 secs.; 540 m tape (18 cm reel with LP tape) within 150 secs.
- Provided with two head-systems, each consisting of one erase head, one recording head and one playback head; (six heads in total).
- Provided with two capstans and two pinch rollers, one set for each tape-transport direction.
- Equipped with one Hall-effect motor (collectorless D.C.-motor) for driving the capstans and two D.C. motors for driving the turntables.
- Tape transport reaches nominal speed within 300 msecs.
- Bias reaches nominal value within 100 secs.
- Switching time in the case of "reverse" is max. 2 secs.
- Bias and erase frequency: 114 kHz (± 10%).
- Power consumption: max. 120 W.
- Output power: 2 x 20 W sinewave power *), 2x30 W music power.
- Harmonic distorsion: less than 1% *).
- Frequency response of recorder section;

19 cm/sec without filter:	40 - 20,000 Hz within 6 dB	
	40 - 12,500 Hz within 3/5 dB *)	
with filter [1]) :	40 - 16,000 Hz within 6 dB	
	40 - 12,500 Hz within 3/5 dB *)	
9.5 cm/sec.:	40 - 15,000 Hz within 6 dB	
	40 - 12,500 Hz within 3/5 dB *)	
4.75 cm/sec.:	60 - 8,000 Hz within 6 dB	

[1]) For suppression of the annoying whistle-tone during stereo radio transmissions, the input circuits of inputs "TUN" (tuner; 51) and "AUX" (auxiliary; 48) include a filter which reduces the frequency range for both inputs to 16,000 Hz.

- Mechanical noise (UAN-L1051): ⩽ 37 dB.
- RUMBLE filter: −10 dB at 30 Hz.
- SCRATCH filter: −12 dB at 15 kHz.
- PHYS filter (physiology): +14 dB at 50 Hz; +6 dB at 10 kHz.
- Signal/noise ratio:

Signal/hiss:
at 19 cm/sec.: ⩾ 50 dB −D3 = 3% *);
at 9.5 cm/sec.: ⩾ 50 dB − D3 = 3% *);
at 4.75 cm/sec.: ⩾ 48 dB −D3 = 3 %.

Signal/hum:
at 19 cm/sec: ⩾ 45 dB *);
at 9.5 cm/sec.: ⩾ 45 dB *);
at 4.75 cm/sec.: ⩾ 45 dB.

- Wow and flutter measured with EMT 420 A acc. to DIN 45 507:

at 19 cm/sec.: ⩽ ± 0.15 % *);
at 9.5 cm/sec.: ⩽ ± 0.2 % *);
at 4.75 cm/sec.: ⩽ ± 0.35 %.

- Max speed error:

at 19 cm/sec.: ± 1 % *);
at 9.5 cm/sec.: ± 1 % *);
at 4.75 cm/sec.: ± 2 %.

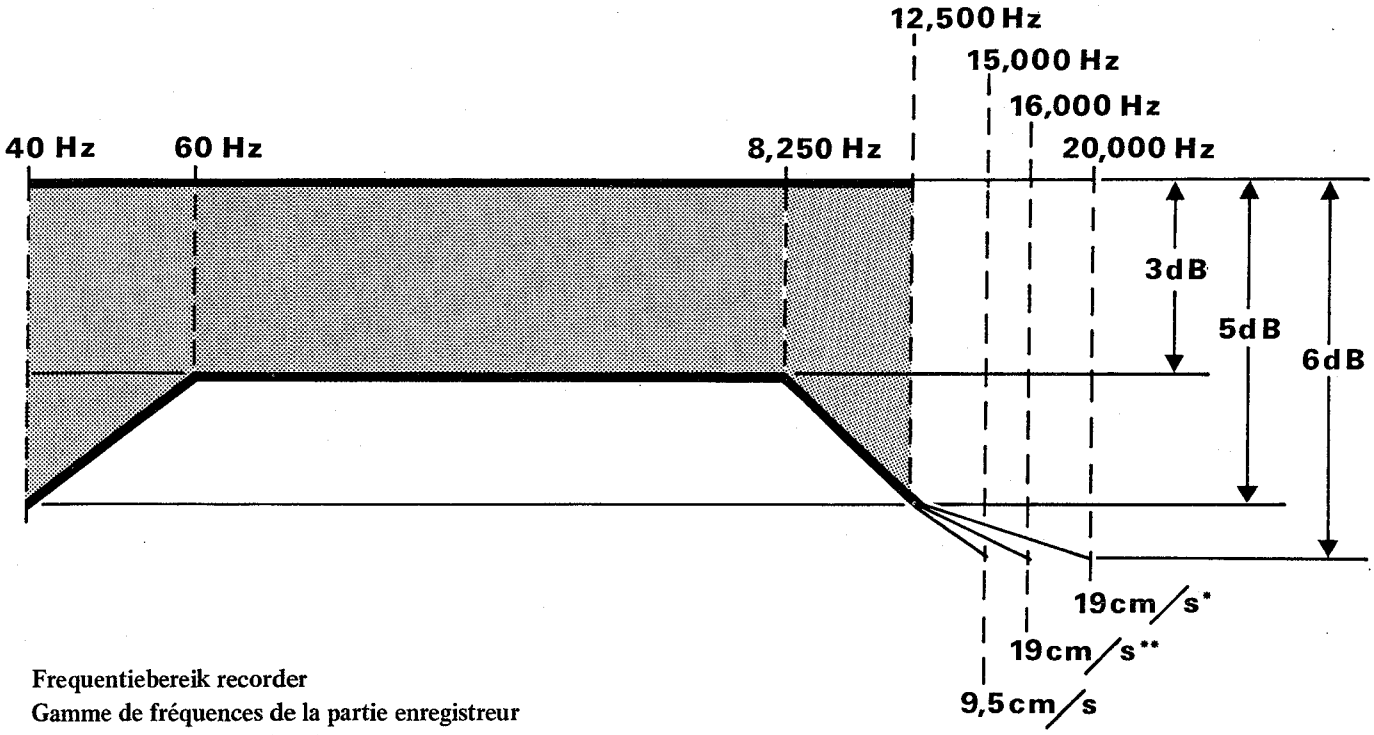
- Equalization during playback:

at 19 cm/sec.: 50 + 3180 µsecs.
at 9.5 cm/sec.: 90 + 3180 µsecs.
at 4.75 cm/sec.: 120 + 3180 µsec.

- Dimensions without cover (without 26.5 cm reels), vertical position, width x height x depth: 520 x 500 x 210 mm (20 1/2" x 19 3/4" x 8 1/4").
- Weight: approx. 20 kg (approx. 44 lbs.).
- Suitable for use in tropical climates.

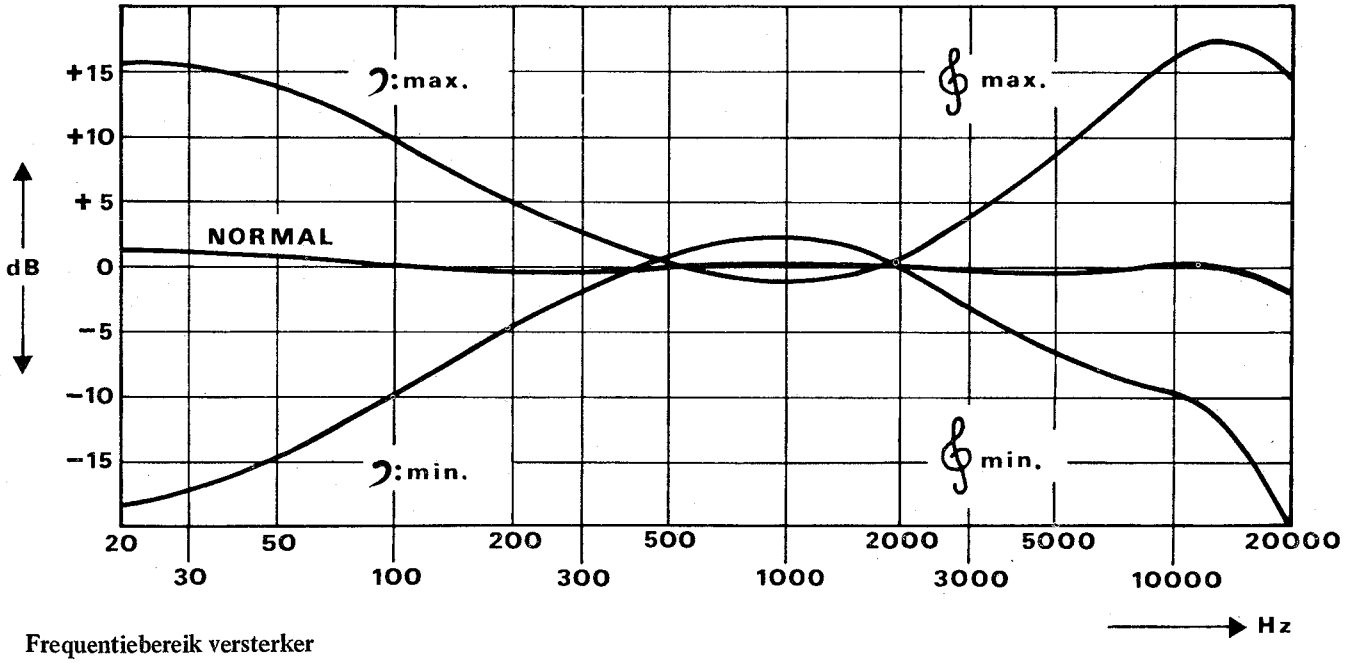
*) Values marked with an asterisk comply with the Hi-Fi standard DIN 45 500.

The characteristics showing the frequency range of the amplifier, recorder, the rumble and scratch filters, the harmonic distortion and physiology will be found on the last pages of the operating instructions.

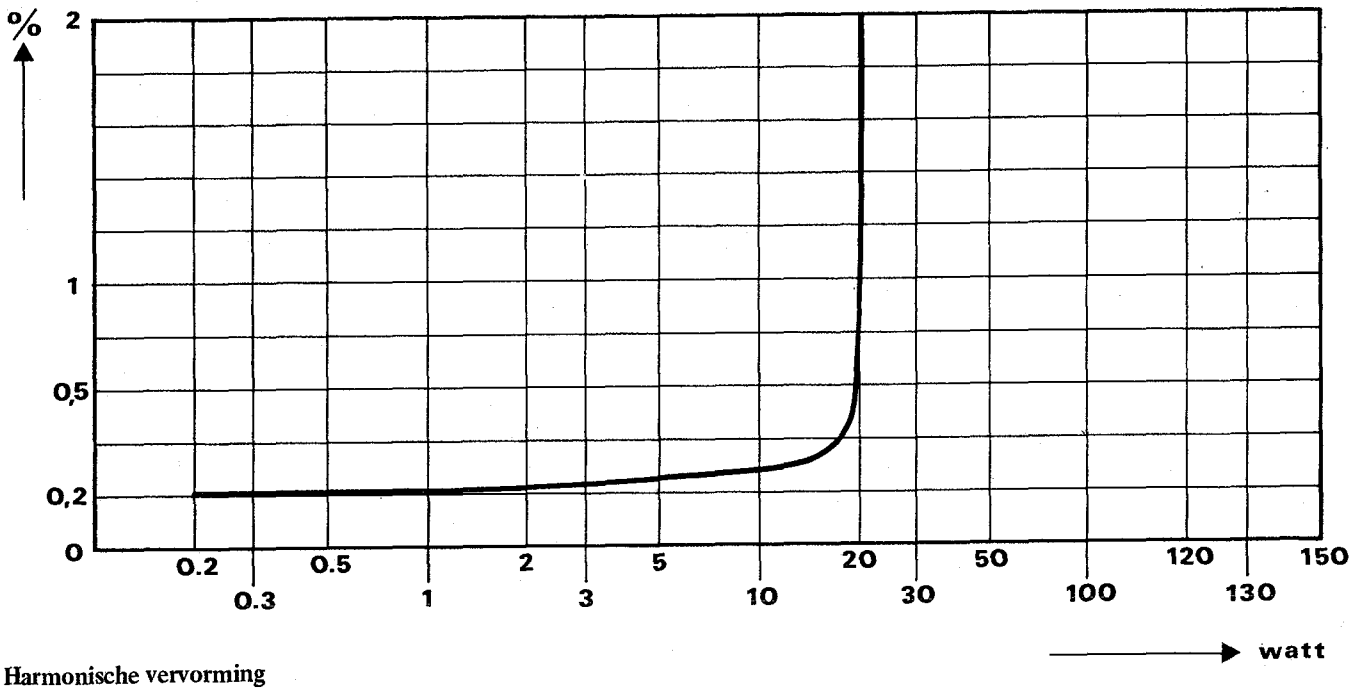


Frequentiebereik recorder
Gamme de fréquences de la partie enregistreur
Frequenzgang des Laufwerkes
Frequency range recorder
Margen de frecuencias, parte registradora
Gamma di frequenze della parte registratore

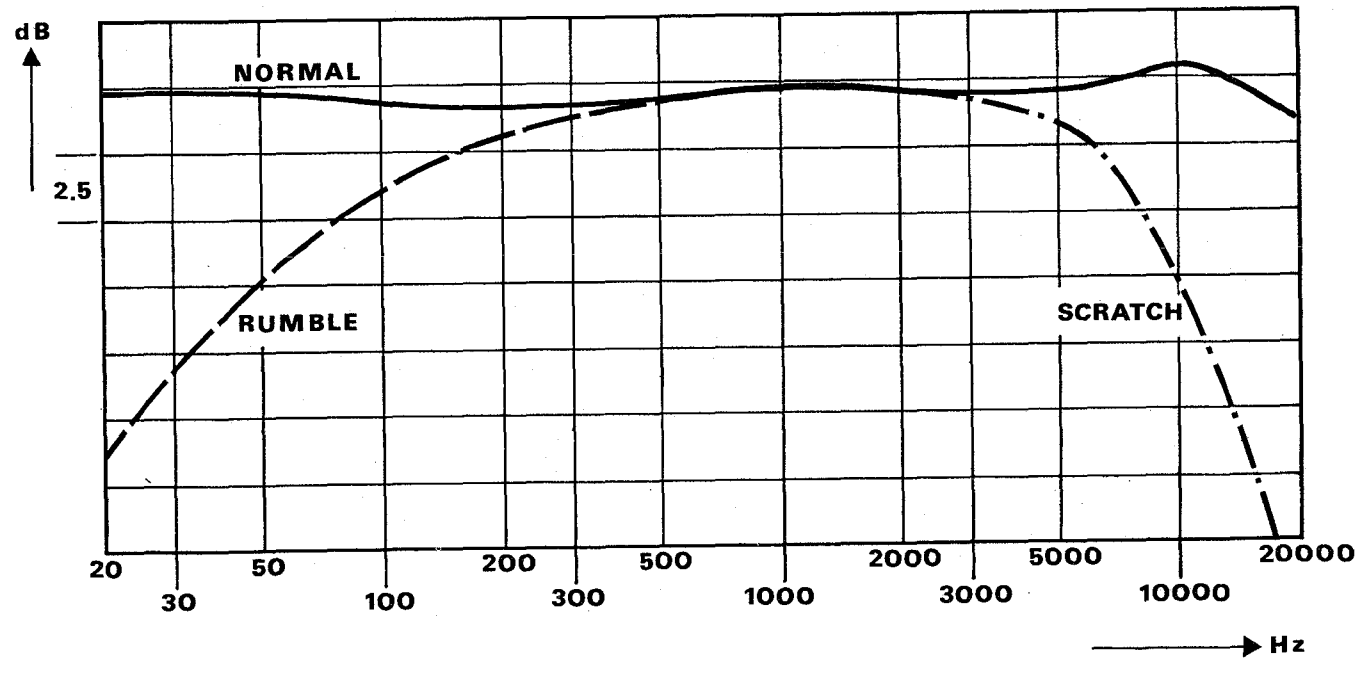
*)	zonder filter	*)	sans filtre	*)	ohne Filter
**)	met filter	**)	avec filtre	**)	mit Filter
*)	without filter	*)	sin filtro	*)	senza filtro
**)	with filter	**)	con filtro	**)	con filtro



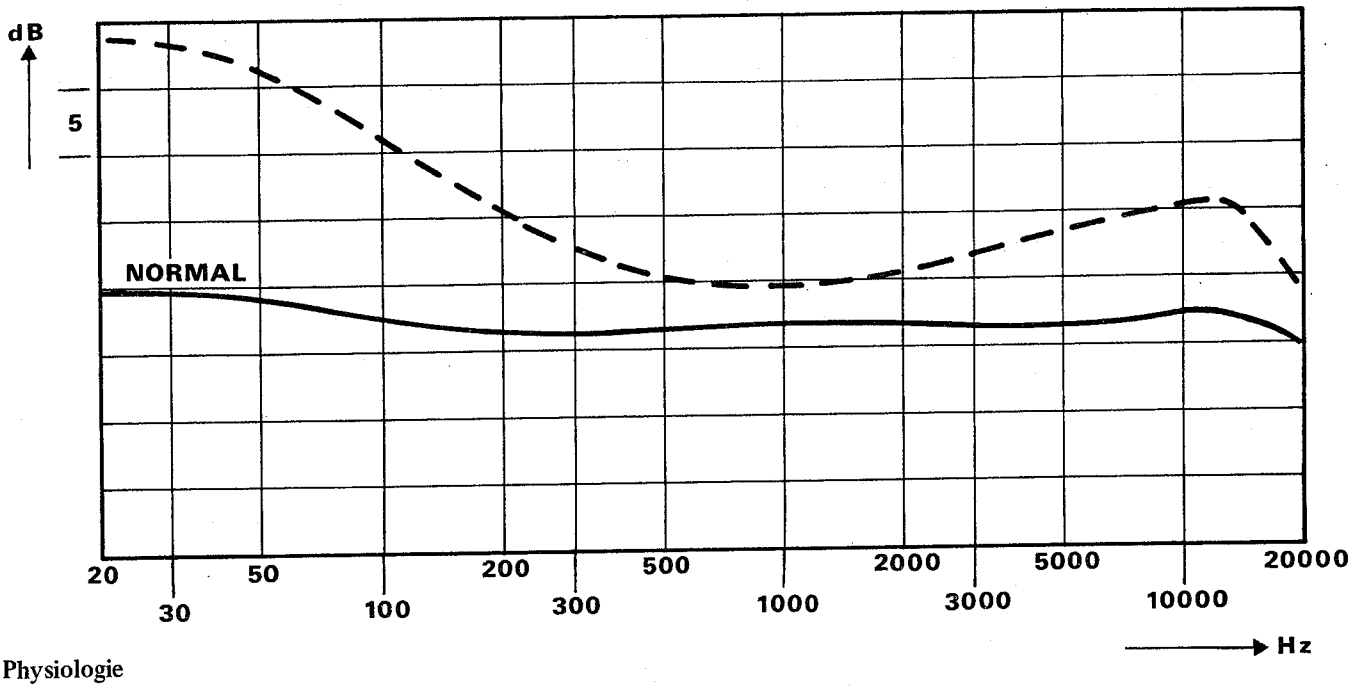
Frequentiebereik versterker
Gamme de fréquences de la partie amplificateur
Frequenzgang des Verstärkers
Frequency range amplifier
Caracteristica de frecuenzia, parte amplificadora
Gamma di frequenze della parte amplificatore



Harmonische vervorming
Déformation harmonique
Klirrfaktor
Harmonic distortion
Distorción armónica
Distorsione armonica



Dreun- en ruisfilter
Filtre d'aiguilles et filtre anti-ronflement
Rumble- und Scratch-Filter
Rumble and Scratch filter
Filtros "rumble" y "scratch"
Filtri anti-ronzio ed anti-fruscio



Physiologie
Compensation physiologique
Contour
Physiology
Compensación fisiológica
Compensazione fisiologica